THE TURRIFF METEORITE FROM VICTORIA, AUSTRALIA

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The Turriff meteorite is a new L5 chondrite found near the township of Turriff, in north-western Victoria, Australia, in 1994. The single 218 g stone has a near-complete fusion crust altered to goethite. The meteorite contains abundant well-defined chondrules, together with blebs of troilite, kamacite and rare taenite, set in a recrystallised matrix consisting mainly of low-Ca orthopyroxene, olivine and plagioclase. Microprobe analyses of the olivine (Fo_{76}) and orthopyroxene (Fo_{20}) are typical of L5 chondrites. The meteorite shows no evidence of shock features (S1 on scale) and is relatively low on the scale of weathering (W0–W1), with veinlets of iron oxide permeating the matrix. The Turriff meteorite is the eleventh meteorite recorded in Victoria.

Key words: Turriff meteorite, Victoria, L5 chondrite.

THE TURRIFF meteorite is a new L5 chondrite, discovered in a ploughed paddock in northwestern Victoria's Mallee region in 1994. The find site (35°29.7′S,142°37.3′E) is about 13 km ESE of the township of Turriff, in flat, semi-arid, wheat-farming country with a sandy soil covering (Fig. 1). The find was made by Mr David Rowney, who sold the meteorite to Museum Victoria early in 1997. Its registered number is E14405. The name and the data required for classification have been approved by the Nomenclature Committee of the Meteoritical Society (in Grossman 1998). The Turriff meteorite is only the eleventh recorded meteorite from Victoria.

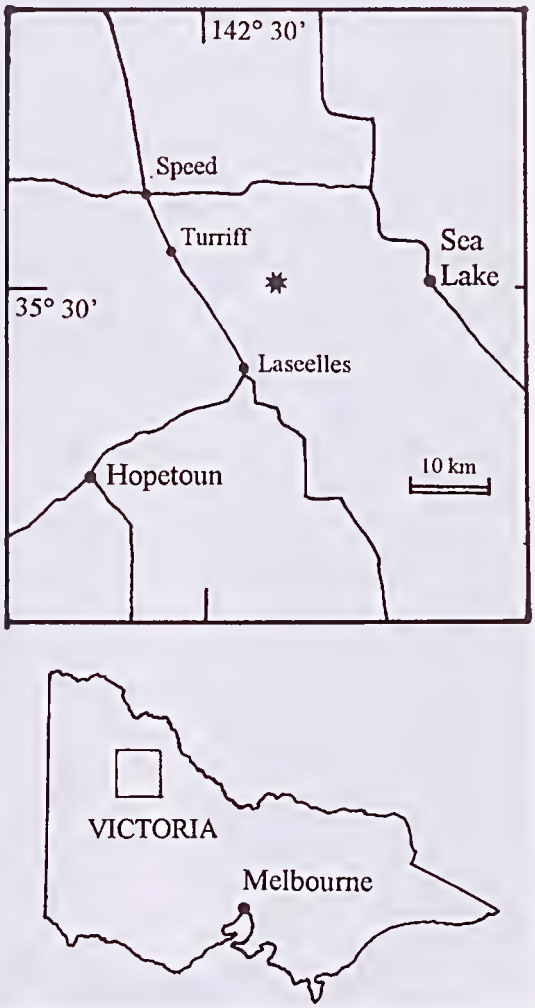

Fig. 1. Location map showing find site for the Turriff meteorite (✳).

DESCRIPTION

The meteorite is a 6-sided, slightly tapering, rectangular block with rounded edges, dimensions of 7 × 4.5 × 3.5 cm and a mass of 218 g (Fig. 2). The original fusion crust has completely altered to goethite showing a dimpled surface and well-preserved shrinkage fractures. The crust was complete except for two small regions at the narrow end of the stone. A slice taken from this end was used to make a polished thin section.

The internal portion of the meteorite shows abundant dark grey chondrules set in a white, partly friable matrix. In thin section, the chondrules are distinct and consist mainly of granular olivine/

orthopyroxene/plagioclase and barred orthopyroxene/plagioclase intergrowths. They range in diameter mainly between 0.3 and 1.5 mm, with a few larger ones reaching 2.5 mm across. The recrystallised matrix contains angular to slightly rounded grains of orthopyroxene and olivine, with minor amounts of plagioclase and grains and blebs of troilite, kamacite and tacnite. The olivine grains show sharp extinction and irregular fractures. Of the opaque minerals, troilite is the most common, forming ragged grains and patches up to 0.5 mm across. Kamacite grains are more common and larger (up to 0.5 mm across) than taenite. Veinlets of iron hydroxide permeate the matrix. Clinopyroxene and chromite were not detected.

Microprobe analyses were obtained on the main phases using a Camcca SX50 instrument operating at 15 kV and a 25 µm beam current, and using natural and synthetic standards (see Table 1). The olivine in both the chondrules and the groundmass is homogeneous in composition, with an average formula of $Fo_{75.8}Fa_{23.7}Te_{0.5}$, ie. 100(Fe+Mn)/(Fe+Mn+Mg) = 24 (% mean deviation in Fe = 2). The low-Ca orthopyroxene is Mg-rich with an average composition expressed as $En_{78.3}Fs_{20.2}Wo_{1.5}$ (% mean deviation in Fe = 2.5 %). The plagioclase composition is in the range oligoclase-andesine. The kamacite is quite uniform in composition, with Fe/Ni ranging between 13.5 and 15.1. Tacnite is rich in nickel, with Fe/Ni varying between 0.98 and 1.96.

	1	*2*
SiO_2	38.53	55.50
TiO_2	—	0.14
Al_2O_3	—	0.14
Fe_2O_3	—	
Cr_2O_3	0.04	0.14
NiO	0.03	0.04
FeO	21.57	13.34
MnO	0.50	0.53
MgO	38.41	28.52
CaO	—	0.70
Na_2O	—	
K_2O	—	
Total	99.08	99.05

Table 1. Microprobe analyses of silicate minerals in the Turriff meteorite. *1* = average olivine in chondrules and matrix (5 grains); *2* = average opx in chondrules and matrix (10 grains).

CLASSIFICATION

A full chemical analysis of the Turriff meteorite was not carried out, but the meteorite may be classified on textural and mineralogical grounds. Based on the above features, and according to the chondrite classification criteria of Dodd (1981) and Van Schmus & Wood (1967), the Turriff meteorite is a borderline L5–6 chondrite. However, the Wo content of the orthopyroxene is typical of the range shown by L5 chondrites (Scott et al. 1986). The absence of undulose extinction and planar fractures in olivine indicates the meteorite is unshocked (S1 on the scale of Stöffler et al. 1991). The meteorite shows features characteristic of W0–W1 weathering (on the scale of Wlotzka 1993), suggesting a relatively young fall, perhaps of the order of a few thousand years or less.

CONCLUSION

There are few similar L5–6 meteorites recorded from the Mallee region of Victoria, although the semi-arid, flat terrain and sandy soils lend themselves to meteorite preservation. The Bealiba meteorite (Birch 1991) was found some 180 km to the southeast of Turriff, and the Kulnine meteorite (Walcott 1915) some 150 km to the NNW. Bealiba and Turriff are superficially similar meteorites, but show slight differences in mineralogy (for example, in Bealiba olivine is $Fo_{74.4}$ and orthopyroxene is $Fs_{22.5}$), while Kulnine shows unusual chemical and textural features (Mason 1973).

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Fig. 2. Photograph of Turriff meteorite (7 cm high).

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